Tables of contents listing all chapters in the CKD & ESRD volumes, the main topics covered within them, & the reference sections & appendices; pages 7–9 of Volume One & pages 195–197 of Volume Two.

Information map listings of central topics in the ADR; pages 10–11 of Volume One & pages 200–201 of Volume Two.

Chapter tables of contents listings of all two-page spreads; found on the third page of each chapter.

Glossary with a list of acronyms; page 180 of Volume One & page 500 of Volume Two.

FINDING WHAT YOU NEED IN THE ANNUAL DATA REPORT

CD-ROM both volumes of the ADR, slides of all figures, Excel files of all data, & complete reference tables; shipped with the ADR.


Chapter summaries central points from each two-page spread; found on the last page of each chapter.

Index to the CKD & ESRD volumes; page 185 of Volume One & page 521 of Volume Two.
2010 USRDS Annual Data Report

Volume Two

Atlas of end-stage renal disease in the United States

National Institutes of Health
National Institute of Diabetes & Digestive & Kidney Diseases
Division of Kidney, Urologic, & Hematologic Diseases
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When I read of an expanding universe, of novas and red dwarfs, of violent activities, explosions, disappearances of suns and the birth of others, and then realize that the news of these events, carried by light waves, are records of things that happened millions of years ago, I am inclined to wonder what is happening there now. How can we know that a process and an arrangement so long past has not changed radically or revised itself? It is conceivable that what the great telescopes record presently does not exist at all, that those monstrous issues or the stars may have ceased to be before our world was formed, that our Milky Way is a memory carried in the arms of light.

JOHN STEINBECK
The Acts of King Arthur & His Noble Knights
at www.usrds.org

PDF files of the 2010 ADR, booklet, & Researcher’s Guide ✪ PowerPoint slide files of all ADR figures & tables, & Excel files of the underlying data ✪ Excel files of the complete reference tables ✪ Render, our online query application for accessing USRDS data ✪ An online application for requesting data from the USRDS ✪ A navigable index of ADR figures & tables

new to this edition of the annual data report

An expanded volume on chronic kidney disease ✪ A chapter on the transition to ESRD in nursing home patients, including information on cognitive function ✪ Data on use & costs of the Medicare Part D prescription drug benefit for both CKD & ESRD patients ✪ An Emerging Issues chapter on hospital admissions for infection ✪ A Special Studies chapter with data on prescription drug therapy in patients with heart disease, the association of BMI & heart failure, bariatric surgery, patients receiving information on transplant options at the initiation of ESRD therapy, & the use of nutritional therapies ✪ Comparative data on costs in the U.S. & Taiwan ✪ New data on the incidence of ESRD in Asian & indigenous populations
Volume Two: ESRD

- Chapter Details 196
- Information Map 198
- Program Summary & Retrospective 200
- Introduction to Volume Two 202

Précis: An introduction to ESRD in the United States 209

HP2010 Healthy People 2010 223

1. Emerging issues 239
2. Incidence & prevalence 253
3. Patient characteristics 267
4. Treatment modalities 277
5. Clinical indicators & preventive health 287
6. Morbidity & mortality 301
7. Transplantation 311
8. Pediatric ESRD 325
9. Special studies 335
10. Providers 353
11. Costs of ESRD 367
12. International comparisons 383

Reference tables 397

- Appendix A Analytical Methods (Volume Two) 462
- Appendix B USRDS Products & Services 494
  - Glossary 500
  - CMS Forms 507
  - Index 511
  - Image Credits 524
  - Colophon 526

Data Requests 462

Data Release Agreement 503

International Data Collection Form 505
Volume One: CKD

PRÉCIS: An introduction to chronic kidney disease in the United States + 17
- Summary statistics: awareness, treatment, & control; patient characteristics; prescription drug therapy; hospitalization & mortality; cardiovascular disease; the transition zone in nursing home patients; the transition to ESRD; acute kidney injury; costs of CKD

ONE: Chronic kidney disease in the general population + 30
- Strategies for identifying CKD; comorbidity burden; clinical & biochemical abnormalities; awareness, treatment, & control of disease conditions; predictive models for CKD; mortality

TWO: Chronic kidney disease identified in the claims data + 53
- Incidence & prevalence of recognized CKD; CKD as defined by the new diagnosis codes; comorbidity burden in patients with CKD; describing CKD through laboratory values

THREE: Care of patients with chronic kidney disease + 65
- Identified CKD & physician follow-up; laboratory evaluations; prescription drug therapy; biochemical levels & drug therapy

Volume Two: ESRD

PRÉCIS: An introduction to end-stage renal disease in the United States + 209
- Trends in patient counts & spending; modalities; quality of care; hospitalization & mortality; expenditures

HEALTHY PEOPLE 2010 + 223
- Incident rates; cardiovascular disease; counseling prior to ESRD; fistula use; transplantation; diabetes; care of patients with CKD & diabetes; urine microalbumin measurements; vaccinations; network achievement of HP2010 objectives

ONE: Emerging issues: hospital admissions for infection + 239
- All-cause & cause-specific hospital admissions; hospitalizations for vascular access infection; outpatient antibiotic use; infectious hospitalization & antibiotic use; mortality & antibiotic use

TWO: Incidence & prevalence + 253
- Incidence; prevalence; incident rates & racial differences; rare diseases; network populations

THREE: Patient characteristics + 267
- Patient care prior to initiation; anemia & treatment; laboratory values at initiation; transplant options; wait list & transplantation

FOUR: Treatment modalities + 277
- Incident modality; prevalent modality; home hemodialysis; introduction to Part D

FIVE: Clinical indicators & preventive health + 287
- Anemia treatment & hemoglobin control; preventive care; vascular access in prevalent patients; overview of Medicare Part D use
FOUR morbidity & mortality \( \uparrow \) 77
hospitalization rates in CKD & non-CKD patients; infectious hospitalizations; mortality rates

FIVE cardiovascular disease in patients with chronic kidney disease \( \uparrow \) 87
prescription drug therapy; survival & hospitalization; prevalent disease states; treatment for heart disease

SIX outcomes in the transition zone in nursing home patients with CKD \( \uparrow \) 99
cognitive function; physical function; mortality

SEVEN the transition to end-stage renal disease \( \uparrow \) 109
patient care & laboratory testing prior to ESRD; prescription drug therapy & medication continuity in the transition to ESRD.

EIGHT acute kidney injury \( \uparrow \) 121
characteristics of patients with AKI; overall hazard & adjusted rates of AKI; patient care & outcomes following AKI hospitalization

NINE costs of chronic kidney disease \( \uparrow \) 133
overall costs; components of costs; Medicare Part D costs; CKD costs in the U.S. & Taiwan

REFERENCE TABLES: CKD \( \uparrow \) 145

SIX morbidity & mortality \( \uparrow \) 301
overall hospitalization; outcomes; hemodialysis matched to peritoneal dialysis; cause-specific hospitalization & mortality

SEVEN transplantation \( \uparrow \) 311
kidney transplant wait list; kidney donation & transplantation; transplant discharge & follow-up; transplant outcomes; transfusions & panel-reactive antibodies

EIGHT pediatric end-stage renal disease \( \uparrow \) 325
patient counts; preventive care & hospitalization; first-year hospitalization & mortality

NINE special studies \( \uparrow \) 335
cardiovascular special studies; rehabilitation & quality of life special studies; nutrition special studies

TEN providers \( \uparrow \) 353
provider growth; anemia treatment; clinical monitoring; preventive care; costs for interventions & preventive care; vascular access & fluid overload hospitalizations; standardized hospitalization & mortality ratios

ELEVEN costs of end-stage renal disease \( \uparrow \) 367
overall costs of ESRD; costs overall & for injectables & vascular access; racial differences in costs; costs in matched & unmatched dialysis populations; Medicare Part D costs

TWELVE international comparisons \( \uparrow \) 383
incidence & prevalence of ESRD; dialysis; transplantation; incident ESRD rates in Asian & indigenous populations

REFERENCE TABLES: ESRD \( \uparrow \) 397
PATIENTS

In 2008, 102,876 new ESRD patients began therapy on hemodialysis, 6,377 started on peritoneal dialysis, and 2,644 received a preemptive transplant. The prevalent ESRD population on December 31, 2008 included 354,600 patients on hemodialysis, 26,817 on peritoneal dialysis, and 165,619 with a transplant; 75,533 patients were on the transplant wait list. The rate per million population of patients receiving ESRD therapy in 2008 was 5,205 for African Americans, 2,700 for Native Americans, 1,992 for Asians, and 1,248 for whites. Compared to 44.4 percent of the general Medicare population, 50.2 percent of CKD patients, 59.6 percent of those with a kidney transplant, and nearly 70 percent of dialysis patients were enrolled in the Medicare Part D prescription drug plan in 2007.

TRANSPLANT In 2008, 11,382 patients received a kidney transplant from a deceased donor, and 5,968 from a living donor. Five years after listing in 2003, 21.4 percent of African American patients, and 25.1 percent of Asian patients, were still waiting for a transplant, compared to 13.5 percent of white patients.

SURVIVAL One in three dialysis patients initiating in 1999–2003 survived five years after the start of ESRD therapy. Of patients receiving their first transplant in 1999–2003, three in four survived at least five years after the transplant.

When hemodialysis patients are matched to peritoneal dialysis patients, overall unadjusted survival is similar for both modalities.

COSTS In 2008, Medicare spending for ESRD reached $26.8 billion, with 3.9 percent of all Medicare dollars spent on patients with the disease. Total outpatient expenditures for ESRD reached $8.3 billion in 2008. In 2008, $1.8 billion was spent on erythropoiesis stimulating agents. Total Medicare expenditures per person per year in 2008 reached $77,506 for hemodialysis patients, compared to $26,668 for patients with a transplant.
1861 Thomas Graham uses term “dialysis” to describe solute transfer through a semipermeable membrane
1940s Dr. Willem Kolff develops & uses first successful artificial kidney
17 June 1950 Ruth Tucker receives first kidney transplant
1960 Dr. Belding Scribner & Wayne Quinton develop Teflon shunt, introducing the first permanent vascular access & making it possible for patients to survive on maintenance dialysis
9 March 1960 Dr. Scribner leads team that inserts the shunt in Clyde Shields, who survives 11 years on intermittent dialysis
31 October 1972 U.S. Congress passes legislation authorizing the end-stage renal disease program, & extending Medicare coverage to Americans with ESRD
1 July 1973 ESRD program launched

Omnibus Budget Reconciliation Act (OMBA) includes Medicare Secondary Payor provision
Composite rate payment system for dialysis becomes effective; cyclosporine introduced

1972 Congress authorizes medical coverage of ESRD
1978 Congress authorizes creation of ESRD networks

U.S. Dept. of Health & Human Services develops Healthy People 2000 initiative

Center for Medicare & Medicaid Services (CMS) launches Fistula First initiative

60,000 patients receive treatment for ESRD
United Network for Organ Sharing (UNOS) created
UNOS begins to operate the Organ Procurement & Transplantation Network (OPTN)
National Kidney Foundation (NKF) launches the Dialysis Outcomes Quality Initiative (KDOQI)
NKF publishes KDOQI guidelines; Health Care Financing Administration (HCFA) begins Hematocrit Measurement Audit program

1972

548,000 patients receive treatment for ESRD; CMS adopts 26 new Clinical Performance Measures to monitor the quality of care received by ESRD patients

1972 Congress authorizes medical coverage of ESRD
1978 Congress authorizes creation of ESRD networks
This is the twenty-second annual report on the end-stage renal disease (ESRD) program in the United States, and the eleventh in our atlas series, which provides an in-depth, graphic presentation of data spanning the last quarter century. For the third year we include a volume on chronic kidney disease (CKD), with information on the prevalence of the disease in the general population and on recognized CKD in the Medicare and employer group health plan (EGHP) databases. Data on risk factor awareness, treatment, and control highlight the challenges of providing care to patients with kidney disease. We also examine access to care, demonstrating that, in the years before CKD advances to ESRD, referral to a nephrologist happens far less frequently than previously thought, complicating the planning for preemptive kidney transplantation or placement of a hemodialysis or peritoneal dialysis access.

Volume Two continues to focus on ESRD, and on the historical surveillance data that were the basis of the first USRDS reports. We summarize the ESRD program in the United States, and examine public health issues such as morbidity and mortality in the first year of therapy—an area in which there has been little progress over the last ten years. This year, however, we show that first-year survival has begun to improve, paralleling recent progress in survival following the first year of treatment. At the end of 2008, the ESRD program was treating 547,982 dialysis and transplant patients—a 3.9 percent increase from 2007. There were 112,476 new cases of ESRD reported, 1.3 percent more than in 2007. The population returning to dialysis after a failed kidney transplant increased 1.3 percent, to 5,459. Growth in the incident population should be viewed with caution, as it may take several years to determine if the increase will be sustained. Late reporting of data is always an issue, as complete and stable incident counts sometimes take several years to be finalized.

In this year’s Précis we again provide an overview of ESRD patients in the U.S., their care, and their expenditures. We examine pre-ESRD care as reported on the ESRD Medical Evidence form (ME), which is used to register all ESRD patients. We also look at dialysis modality use, the transplant wait list, and indicators of quality of care, and illustrate recent changes in hospitalization rates, mortality rates, and five-year survival in the dialysis population. Prevalent death rates have been falling for a number of years, and death rates in the first year of dialysis have declined since 2004. Figures on ESRD expenditures show per person and total costs in the program, and compare costs for Medicare and employer group health plan patients during the transition from CKD to ESRD. Total Medicare expenditures for separately billed intravenous medications have been stable since 2004, reflecting changes in payment policies implemented by CMS.

We have reported data related to Healthy People 2010 objectives for several years, tracking progress in basic public health goals for the kidney disease population. Several targets are close to being met, including cardiovascular death rates, fistula use among new dialysis patients, and evaluations of those with diabetes.
This year’s chapter on emerging issues focuses on infectious complications in the first year of hemodialysis. In the third month of treatment, rates of hospitalization for vascular access infection are highest among patients age 20–44, and have increased almost 400 percent for these patients since 1991. The rise in hospitalizations due to bacteremia/sepsis is also a concern, particularly in light of the slight decline in hospitalizations for vascular access infection. These two observations suggest that there has been a shift in the rates of complications, rather than true progress. The decline in catheter placement rates noted in the HP2010 chapter does not appear to be translating into lower rates of hospitalization for infection, possibly reflecting the use of more cuffed, long-term catheters, which expose patients to persistent risks not associated with an internal access such as a fistula or graft. To provide insight as to how these infectious complications are treated, we conclude the chapter by examining the use of outpatient antibiotics, both oral and intravenous.

Chapter Two reports incident and prevalent counts, highlighting the rising rates of ESRD due to diabetes and hypertension in younger African Americans, and illustrating how growth in the incident population appears to be driven by the large number of patients from the baby boomer generation. We look again at rates of ESRD in major metropolitan areas; data here may help direct public health programs in high-burden areas of the country. Interestingly, the highest incidence of ESRD for both whites and African Americans is reported in Pittsburgh, Pennsylvania, while rates of prevalent ESRD are also high in Pittsburgh for these two populations, and in St. Louis, Missouri, for Hispanics. Later in the chapter we present updated data on patients with ESRD caused by one of the diseases seen infrequently in the ESRD population, such as Fabry’s and systemic lupus erythematosus.

In Chapter Three we present information from data fields on the latest revision of the ME form, released in the spring of 2005. Information on vascular access, for example, shows that 82 percent of incident patients use a catheter at their first outpatient dialysis treatment — possibly contributing to the high rates of hospitalization for infection in the first months on dialysis, as discussed in Chapters One and Six. Data show that fewer patients are now being treated with erythropoiesis stimulating agents (ESAs) prior to the start of ESRD therapy, and that hemoglobin levels at the initiation of treatment have fallen from a peak of 10.5 g/dl in 2006 to 10.0 g/dl in December, 2008. Safety concerns raised by recent clinical trials may have led providers to withhold therapy until patients reach lower hemoglobin levels. The target hemoglobin based on the FDA package insert, however, is 10–12 g/dl, leading to greater efforts to correct hemoglobin levels after the start of dialysis in those with levels lower than 10 g/dl. These findings may have an impact on anemia treatment under the CMS bundled payment system, to be implemented in January, 2011.

The chapter also describes laboratory values at the initiation of therapy, and concludes with data on patients informed at initiation of their options for kidney transplantation. Informed patients are more likely to be placed on the transplant wait list.

Chapter Four illustrates trends in modality use. Peritoneal dialysis is now used by just 6 percent of incident dialysis patients, down from 11–14 percent in the mid-1990s. New guidelines on peritoneal dialysis treatment, the emergence of daily home hemodialysis, and the new payment bundle for all modalities may change perceptions about the use of home therapies. Patients treated with these therapies use lower amounts of ESAs and IV medications, thereby costing less under a bundled payment system. The chapter also shows that insurance coverage in the ESRD population appears to be changing, with a larger percentage of patients covered by Medicare Advantage. This may reflect new adjustments to the payment rates, the inclusion of more chronic disease adjusters, and added Part D prescription drug benefits. The percentage of patients with dual Medicare/Medicaid coverage is growing in the prevalent hemodialysis population, possibly reflecting the continued high economic impact of ESRD on patient finances.

Chapter Five, on clinical indicators of care, assesses dialysis adequacy, vascular access, anemia treatment, anemia correction in the first months of ESRD, IV iron therapy, and preventive care in the diabetic and general ESRD populations. We look, for instance, at
the marked differences in vascular access complication rates associated with the use of fistulas, catheters, and grafts. Catheter use in prevalent patients fell below 20 percent in 2008, though it will take several years to determine if this decline will be sustained. New this year is information on prescription medication use under the new Medicare Part D benefit, first implemented in January, 2006. We assess data from 2007, the program's first full year, looking at rates of enrollment and use of the benefit among ESRD patients.

Data on hospitalization and mortality are presented in Chapter Six. Infectious hospitalization rates among prevalent hemodialysis patients appeared to decline in 2006–2007, but are still 46 percent higher than a decade ago. Although catheter placement rates have fallen, there is concern, as noted above, that use of more permanent cuffed catheters may expose patients to a long-term risk of infection. While rates of hospitalization for vascular access infection have declined, those due to bacteremia/sepsis have increased, possibly reflecting a changing classification of these infectious complications, one which merits careful consideration. Survival of the prevalent population continues to improve, with lower death rates across all vintages, and the rate of first-year mortality continues to fall, reaching 240 deaths per 1,000 patient years for 2007 incident hemodialysis patients. New this year is a comparison of hospitalization and survival by modality, in which we match hemodialysis and peritoneal dialysis populations so as to reduce selection bias; differences in the costs incurred by these matched populations are assessed in Chapter Eleven.

As we illustrate in Chapter Seven, the number of transplants from deceased donors remains stable, while the number from living donors has continued to fall from its peak in 2004 — a decline seen primarily among those younger than 45. Waiting times continue to grow, due to the continued shortage of donated kidneys. And death with a functioning graft continues to be a concern, with cardiovascular disease accounting for 30 percent of those deaths with a known cause. The chapter ends with new data on blood transfusions and panel reactive antibodies.

In Chapter Eight, on the pediatric ESRD population, we lead with data on incidence and prevalence in the last 28 years. Rates of influenza vaccinations continue to be low, with fewer than one in three children receiving this treatment, despite high rates of pneumonia and other respiratory infections. In contrast to adults, for whom hospitalization rates are high in the first months of dialysis and decline within the first year, children have progressively higher rates over the first 15 months after the initiation of treatment. Death rates in children are highest in the first six months of treatment, a pattern similar to that seen in their adult counterparts.

In Chapter Nine, the USRDS Cardiovascular Special Studies Center (SSC) presents data on the use of defibrillators in the ESRD population, examines the use of prescription drugs and their associated outcomes, and looks at obesity, heart failure, and the use of bariatric surgery. The Rehabilitation/Quality of Life SSC presents data from new questions on the ME form examining whether patients are informed of their transplant options at the initiation of ESRD therapy. And the Nutrition SSC examines the treatment of malnutrition in the dialysis population, looking at enteral, parenteral, and anabolic therapies.

The landscape of dialysis providers has altered dramatically, with the consolidation of smaller providers into large chains. In 2005 and 2006 it changed even further, with the acquisition of Renal Care Group by Fresenius Medical Care, and the purchase of Gambro Healthcare by DaVita. In Chapter Ten this year we provide data on the duration of unit ownership among both the consolidated and remaining providers. We also address iron dosing practices and transfusion use, costs for intervention and preventive care, hospitalization for vascular access infection, fluid overload, and heart failure, and regional comparisons of dialysis organizations.

Chapter Eleven, on expenditures related to ESRD, begins with data on spending for injectables. We again present information on costs during the transition from CKD to ESRD, and illustrate expenditures for clinical services, injectables, preventive care, and vascular access. New this year, we highlight differences by race in expenditures for laboratory tests, injectables, and hospitalizations. We also use the new matched hemodialysis and peritoneal dialysis populations to better compare expenditures across modalities;
such comparisons may influence modality use under the new CMS bundled payment system. We conclude with new data on costs associated with the Part D prescription drug benefit.

In Chapter Twelve we summarize data from the international community, and present a new spread on the incidence of ESRD in Asian populations — in the U.S., Taiwan, and Japan — and among indigenous populations in the U.S., Australia, New Zealand, and Canada. We are again grateful to the registries providing this information, allowing us to see the U.S. ESRD community through a wider lens.

Most of the 2010 ADR contains data through December 31, 2008; data on patient characteristics, obtained from the Medical Evidence form, are complete through June, 2009. Only the 2007 Medicare Part D data were available for the 2010 ADR; 2008–2009 data will be available for the 2011 edition.

Current estimated incident and prevalent counts can be found on the USRDS website.

RenDER & the Researcher’s Guide

Our real-time online query system allows users to build data tables and maps. The Renal Data Extraction and Referencing System (RenDER) can be accessed on our website.

To assist users of USRDS data, the Coordinating Center (CC) annually updates the Researcher’s Guide, which provides information on all analytical methods used by the CC, along with a detailed index of files and variables in the USRDS researcher datasets. It is available on our website in PDF format.

USRDS database

The USRDS dataset is a living record of patient care in the U.S., continually updated with new data. Delays in data reporting are unavoidable, and we add late information as soon as it becomes available. This includes data from the ME form, claims for hospital and physician services, and updates of the Medicare Enrollment Database received after the ADR has gone to press.

Administrative oversight

Project Officers (POs) Lawrence Agodoa, MD, and Paul Eggers, PhD, provide direct oversight of the CC and Special Studies Centers (SSCs), and members of CMS, the ESRD networks, and the renal community provide crucial input and feedback through their committee participation.

The Steering Committee, the governing body of the USRDS, is responsible for the operations of the CC and SSCs. It works under the direction of the POs, and includes representatives from CMS, the National Institutes of Health, the CC, and the SSCs. Its responsibilities include coordination among the centers, study design, project tracking, data management and validation, assurance of data availability for researchers and government officials, and oversight of ADR production.

The USRDS External Advisory Committee (Table i.d) plays a major role in advising POs on special studies, data studies, and analyses. It is also responsible for reviewing manuscripts and ADRs.

The Special Studies Review and Implementation Committee, the operations committee for SSC proposals and CC project support, is a collaboration of CMS, the ESRD networks, and the providers. The Data Request Review Committee reviews data requests requiring more than two hours of staff time to fulfill, and makes recommendations to the POs based on the datasets requested and the ways in which the CC can improve data availability.

Reading the maps

Many maps in the ADR are by Health Service Area (HSA), a group of counties described by authors of the CDC Atlas of United States Mortality as “an area that is relatively self-contained with respect to hospital care.”

Maps here present data divided into quintiles, with each range in a legend containing approximately one-fifth of the data points. In the sample map on page 208, for example, one-fifth of all data points have a value of 10.8 or above. Ranges include the number at the lower end of the range, and exclude that at the upper end (i.e., the second range in the sample map is 8.2–<9.2). To facilitate comparisons of maps with data for different periods, we commonly apply a single legend to each map in a series. Because such a legend applies to multiple maps, the data in each
individual map are not evenly distributed in quintiles, and a map for a single year may not contain all listed colors or ranges.

Numbers in gray indicate the mean values of data points in the highest and lowest quintiles; these can be used to calculate the percent variation between quintiles. For maps with shared legends we have provided these values by repeating the legends and inserting the unique quintile values. Mean numbers within the quintiles can be calculated as a simple half-way point.

On the Excel page for each map (found on the website and CD-ROM) we include several numbers to help you interpret the maps and their relation to other data in the ADR. The map-specific mean is calculated using only the population whose data are included in the map itself. This mean will usually not match data presented in tables elsewhere in the ADR, and should be quoted with caution. The overall mean includes all patients for whom data are available, whether or not their residency is known. We also include the number of patients excluded in the map-specific mean, and the total number of patients used for the overall calculation.

Acknowledgements

The ADR could not be produced without the extraordinary work of members of the ESRD community — including the staff of CMS and the ESRD networks — and the dedicated efforts of the USRDS staff and investigators. The efforts of the providers themselves are crucial in the collection of data used by the USRDS, and their dedication to this task is greatly appreciated.

We welcome feedback on all elements of USRDS work. All comments are reviewed by the Director, Deputy Director, and staff of the USRDS in order to improve future materials and to ensure a strong working relationship between the USRDS and the clinicians, researchers, patients, and others involved in the care of ESRD patients across the United States and throughout the world.